

Review of the Species of *Deutereulophus* (Hymenoptera: Chalcidoidea: Eulophidae) of North America

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Abstract.—Although species of *Deutereulophus* (Hymenoptera: Chalcidoidea: Eulophidae) are known in America north of Mexico, none have been described. In this paper five **new species** are recognized: *D. arizonensis*, *D. floridensis*, *D. ocularis*, *D. pecki*, and *D. smithi*, and a key is presented.

Ashmead (1904) described the genus *Eulophopteryx* and included two species, not realizing that the generic name was preoccupied (Möschler 1878). The name *Deutereulophus* was supplied by Schulz (1906) as a replacement for *Eulophopteryx*. Girault (1913) described the genus *Entedonomorpha* and Girault (1913, 1915, 1922, 1938) and Yoshimoto and Ishii (1965) later added several species from Australia and Guam to this genus which was synonymized with *Deutereulophus* by LaSalle and Schauff (1992). Although *Deutereulophus* occurs in North America (Schauff et al. 1997), no species from that region have been described and no keys or other information are available.

The majority of specimens used for this study are from the eastern U.S. due to two factors: 1) extensive malaise trapping by Dr. D. R. Smith in Maryland and Virginia and an extensive collecting effort along the eastern seaboard in the mid to late 1980s by a team of scientists from Canada, and 2) the author is one of the few scientists familiar with the genus and was able

to recognize specimens in these collections and organize them for study. It is difficult, if not impossible, for other researchers to sort material from collections, because of the lack of identification aids or illustrations to guide them. I have not personally been able to examine or sort through all collections and therefore, I have not been able to obtain specimens from many parts of North America. This is especially true for the west coast of the U.S. and Canada. Although western collections have not yielded specimens of *Deutereulophus* to date, it is likely that at least one or a few species occur along the west coast.

In this paper, I review the species from North America and provide names and a key for them.

Acronyms for museums are: (CNC) Canadian National Collection, Ottawa, Ontario, Canada; (USNM) National Museum of Natural History, Smithsonian Institution, Washington, D. C., USA; (BMNH) The Natural History Museum, London, UK. Terminology for morphology follows Gibson (1997). A diagram showing measurements of the head is given in Fig. 9.

KEY TO SPECIES OF *DEUTEREULOPHUS*

- 1) Legs beyond coxae yellow; scutellum smooth (Figs. 5, 8) 2
– Legs beyond coxae at least partly black or brown, scutellum with distinct alutaceous or reticulate sculpture (Figs. 1, 3) 4

- 2) First funicular segment equal in length to second (Fig. 14) *pecki*, n. sp.
 – First funicular segment distinctly longer than second (about 1.5 × as long) (Fig. 13) 3
- 3) Thorax and head with distinct metallic green sheen, posterior margin of the gena on line with the posterior margin of eye; vertex rounded and area behind evenly sculptured
 *floridensis*, n. sp.
 – Thorax and head black, without metallic green coloration; posterior margin of eye projecting behind posterior margin of gena (Fig. 7); vertex with transverse carina just behind ocelli, area below carina with distinct sculpture medially, smooth laterally .. *ocularis*, n. sp.
- 4) Vertex with distinct transverse carina behind ocelli (Fig. 1), nearly smooth behind posterior ocelli *smithi*, n. sp.
 – Vertex rounded and without distinct median carina, mostly reticulate behind posterior ocelli with v-shaped smooth area medially (Fig. 2) *arizonensis*, n. sp.

Deutereulophus Schulz

Eulophopteryx Ashmead 1904: 341, 342, 374.

Types species *Eulophopteryx chapadae* Ashmead (original designation). Preoccupied by *Eulophopteryx* Möschler 1878: 684.

Deutereulophus Schulz 1906: 146. Replacement name for *Eulophopteryx* Ashmead 1904 (not *Eulophopteryx* Möschler, 1878).

Entedonomorpha Girault 1913: 261. Type species *Entedonomorpha tennysoni* Girault (original designation). Synonymy by LaSalle and Schauff 1992: 17.

Diagnosis.—Head concave behind (Fig. 1), often with a transverse carina on the vertex behind the ocelli and with the posterior eye margin contiguous with the back of the head such that there is no noticeable temple when viewed dorsally; eyes setose; clypeus delimited by sutures above and lateral to the mouth margin; pronotum semiglobose, and rounded anteriorly, without a transverse carina; notauli complete; scutellum with curving (sinuate) lateral grooves converging posteriorly and meeting medially (Figs. 3, 5); propodeum with a simple median carina diverging posteriorly and bounding a large open area at the nucha (Figs. 4, 6), laterally with at least a partial plical carina and with a transverse carina below the spiracle that defines the dorsal edge of an area which lies nearly perpendicular to the spiracular surface and that usually contains a group of setae below and medial to the callus setae; petiole with a forward projecting flange on dorsal and lateral

surface; hypopygium reaching about half length of metasoma; outer ovipositor plates visible and generally reticulate; female funicle 3-segmented and with first funicular segment usually pedunculate (Fig. 13), clava 3-segmented; male funicle 4-segmented and usually with at least first 2 funicles pedunculate (Fig. 14); stigmal vein well developed; postmarginal vein equal to or slightly longer than stigmal vein.

Discussion.—While no phylogenetic analysis of relationships within the Eulophinae has yet been published, several characters of the thorax (e.g. the lateral scutellar grooves, complete notauli, median propodeal carina) strongly suggest that *Deutereulophus* is closely related to a group of genera that includes *Hyssopus*, *Elachertus*, and *Diglyphomorphomyia* and several others. The shape of the pronotum is very similar to that found in *Hyssopus* and is a feature not shared by most of the other eulophid genera.

The pedunculate male antennae and the usually pedunculate first funicular segment of the females, however, argue for a close relationship to *Diglyphomorphomyia* (an Australian genus). The presence of a group of setae below the spiracle, which is apparently an extension of the usual line of callus setae, may be unique to this genus. I have not been able to examine all the types of Australian *Deutereulophus* so it is not possible to make a definitive statement about that character at this time. In

some species from the South Pacific region, the area below the callus contains only one or a few setae.

The forward projecting flange (Fig. 4) on the dorsal and lateral surface of the petiole is also a feature which I have not observed in other similar genera of eulophines and which seems to be constant within the species examined. Some species of *Hoplocrepis* have lateral flanges on the petiole, but no dorsal flange.

The posterior bifurcation of the median propodeal carina that forms a large open areola at the posterior median margin of the propodeum, and the presence of at least a short forward projecting lateral carina that originates from the anterior lateral margin of the areola (Figs. 4, 6) both seem to be unique to *Deutereulophus*. They are present in all species and may be the most reliable defining characteristic of the group. I have seen species of *Hoplocrepis* which have a somewhat similar condition in which the median propodeal carina ends posteriorly at the nucha but does not clearly bifurcate or enclose a cell or areola.

The presence of sinuate lateral grooves on the scutellum has been used in keys (e.g. Schauff et al. 1997) but this character, while stable for all North America species I have examined, is highly variable in other parts of the world and has been observed in a modified form in some Australian species of eulophids which I would not place in *Deutereulophus*. Recent authors seem to agree that this genus contains a natural group of related species, and I believe that the characters cited above reinforce that conclusion. Examination of specimens borrowed from museums in the Pacific basin indicate that numerous species exist in that region and that the center of diversity of *Deutereulophus* is probably the Australasian realm.

Deutereulophus arizonensis Schauff, new species

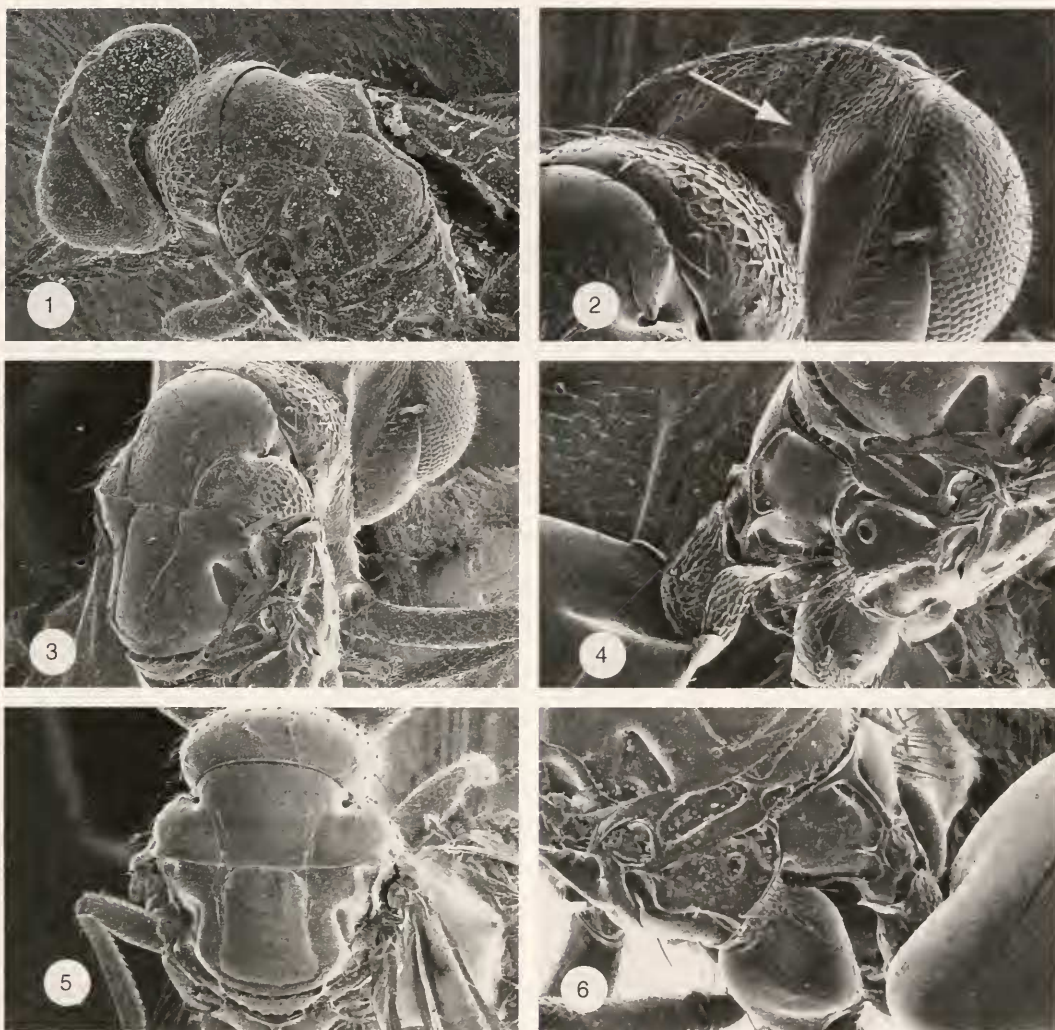
(Figs. 2, 3, 4)

Diagnosis.—Legs yellow except fore coxa black; funicles brown; vertex round-

ed, reticulate behind with inverted v-shaped smooth area (Fig. 2); mesoscutum and scutellum alutaceous (Fig. 3).

This species is similar to *D. smithi* but differs in that *smithi* has the vertex with a distinct transverse carina (Fig. 1), and the area behind the carina is lightly sculptured, nearly smooth, and without a distinct v-shaped area.

Description.—Female. Length 1.9 mm. Color black except: scape yellow, flagellum brown; fore coxa brown to black, rest of leg yellow. **Head**: Face lightly reticulate to nearly smooth, sculpture slightly heavier below toruli. In frontal view, head wider than high (40:35). Gena reticulate. Clypeus set off by irregular lateral and dorsal suture line. Mandible with one large ventral tooth and 3 smaller dorsal teeth. Malar suture complete, slightly curved. Ratio of malar space: eye height 10:32. Toruli inserted level with lower margin of eye. Ratio of width of face: width of eye 34:15. Occiput rounded, reticulate and with a central inverted v-shaped smooth area. Posterior margin of eye on same line as posterior margin of gena. Ocelli slightly removed from margin of occiput, POL 2× OOL. **Antenna**: Scape about 7× as long as wide. Ratio of length of F1:F2:F3:Clava 14:11:11:19, width 6 at F1 to 7 at clava. **Mesosoma**: (Fig. 3). Pronotum reticulate except at posterior margin, with numerous scattered setae. Mesoscutum smooth anteriorly, then becoming reticulate, with 2 pairs of setae along notaular margin, side lobes reticulate laterally, then alutaceous with a group of setae along anterior margin. Axilla smooth. Scutellum alutaceous to reticulate. Metanotum anteriorly projecting out from scutellum and bordered along median dorsal edge by a group of alveoli and by another band of finer alveoli along posterior margin. Propodeum medially smooth, with about 12 long white setae laterad of spiracle and about 20–25 setae below the spiracle. Petiole (Fig. 4) rugose dorsally, as long as wide, anterodorsal flange well developed, with



Figs. 1-6. Scanning electron micrographs of *Deutereulophus*. 1, *D. smithi*, thorax and head. 2, *D. arizonensis*, head, posterior view. 3, *D. arizonensis* thorax. 4, *D. arizonensis*, propodeum and petiole. 5, *D. floridensis* mesosoma. 6, *D. floridensis* propodeum.

lateral flanges well developed. Forewing. Hyaline, $2.3\times$ as long as wide. Submarginal vein with 6-7 dorsal setae. Ratio of submarginal: marginal: stigmal: postmarginal vein = 33:33:12:15. **Metasoma:** Ovate, slightly longer than wide. Ovipositor sheaths reaching just past tip of gaster.

Male.—Unknown.

Distribution.—Known only from Arizona.

Types.—Holotype female with data: Ar-

izona, Patagonia, 27 June 1953. W. W. Wirth Collector. Deposited in USNM.

Etymology.—This species is named for the locality of the type.

Deutereulophus floridensis new species
(Figs. 5, 6, 12)

Diagnosis.—Head, lateral lobes of mesoscutum, and propodeum metallic green; in lateral view, posterior margin of eye not distinctly protruding behind hind margin

of gena; vertex rounded, without transverse carina and area behind uniformly smooth or lightly sculptured; mesoscutal midlobe and axilla smooth; scutellum smooth or very lightly alutaceous (Fig. 5); metasoma mostly yellow; legs white to yellow. Male scape with a small sensory patch containing only about 2 sensilla (Fig. 12).

This species is similar to *D. occularis*, which shares a smooth scutellum and yellow legs. However, *D. floridensis* has the thorax and head distinctly metallic green whereas *D. occularis* has a black head. *D. floridensis* has the posterior margin of the eye in lateral view not projected behind the gena and the vertex is rounded and uniformly sculptured behind (*occularis* with median transverse carina on vertex and the posterior margin of the eye projecting behind margin of gena (Fig. 7) and a distinctly sculptured area below occiput contrasting with the smooth lateral areas).

Description.—Female. Length 1.6–2.0 mm. Color: face, mesoscutal midlobe, axilla, and propodeum, occasionally lateral margin of metasoma metallic green; back of head, pronotum, scutellum, lateral thorax, ventral thorax, petiole black; antenna yellow except clava sometimes light brown; legs yellow to white; metasoma yellow except with brown on lateral margin and usually with an elongate triangular brown area medially on the posterodorsal surface. **Head**: Face and vertex smooth. In frontal view, wider than high (57:38). Gena reticulate. Clypeus set off by irregular suture line. Mandible with one large ventral tooth and 3 smaller dorsal teeth. Malar groove complete, slightly curved. Ratio of malar space: eye height = 8:13. Toruli inserted level with lower margin of eye. Ratio of width of face: width of eye = 31:15. Occiput rounded, area behind smooth to lightly alutaceous, shiny. Posterior margin of eye in lateral view on same line as posterior margin of gena. Ocelli contiguous with margin of occiput, POL 2× OOL. **Antenna**: Scape about 6×

as long as wide. Ratio of length of F1:F2:F3:Clava = 15:11:12:22, width 6 at F1 to 7 at clava. **Mesosoma**: Pronotum weakly alutaceous to smooth, with numerous scattered setae (Fig. 5). Mesoscutum smooth anteriorly, then becoming alutaceous posteriorly, with 2 pairs of setae along notaular margin, side lobes smooth, with group of setae along anterior margin. Axilla smooth. Scutellum very weakly alutaceous medially. Metanotum smooth, projecting out from scutellum anteriorly. Propodeum smooth medially, with about 10 long white setae lateral to spiracle and about 12–15 setae below the spiracle (Fig. 6). Petiole rugose dorsally, about as long as wide, anterodorsal flange small with lateral flanges well developed. Forewing. Hyaline, 2.3× as long as wide. Submarginal vein with 5–6 dorsal setae. Ratio submarginal: marginal: stigmal: postmarginal vein = 40:30:12:15. **Metasoma**: Ovate, slightly longer than wide. Ovipositor sheaths reaching just past tip of gaster.

Male.—Similar to the female except: Antenna with scape about 5× as long as wide. Flagellum with ratio of F1:F2:F3:F4: clava = 15:15:15:15:24. Scape with a very small sensory patch containing only 2 sensilla just above midline (Fig. 12).

Distribution.—Known only from Florida.

Types.—Holotype female with data: Florida: Monroe Co., No Name Key, 23.II–3.VI. 1986. S&J Peck, 86-13, hammock, FLT. Deposited in CNC. Paratypes: 1 female and 2 males with same data; 2 males with same data except 3.VIII–18.XI.1985, S&J Peck, hammock forest, malaise & FLT; 1 female and 1 male with same as previous except 4.V–4.VIII.1985; 5 females and 3 males same as holotype except Fat Deer Key, 18.XI.1985–25.II.1986, S&J Peck, hammock forest, malaise & flight intercept trap; 1 male with same data as previous except 2.VIII–16.XI.1985; 3 females and 5 males same as holotype except Big Pine Key, S1, T67S, R29E, 30.VII–17-XI.1985, S&J Peck, Cactus Hammock, malaise &



Figs. 7–8. Scanning electron micrographs of *Deutereulophus occularis*. 7, Head and anterior mesosoma, side view. 8, mesosoma, dorsal view.

flight intercept trap, forest; 1 female same as previous except 6.VIII–17.IX.1985; 1 female same as holotype except Everglades National Park, 1.5 km NW Royal Palm, 3.III.–28.IV.1985; 1 female same as holotype except N. Key Largo, Sec. 35, 1.VIII–16.XI.1985, S&J Peck, hammock forest, malaise & flight intercept trap; 1 female same as holotype except Sugar Loaf Key, Kitchings, 26.II–6.VI.1986, S&J Peck, 86-29, hammock forest FIT; 1 male same as previous except SE $\frac{1}{4}$, S23, 26.II–6.VI.1986, 86-31, hammock for., FLT, deposited in CNC; 1 female and 1 male same as previous deposited in USNM.

Etymology.—This species is named for the state locality of the type series, Florida.

Deutereulophus occularis Schauff, new species
(Figs. 7, 8, 10)

Diagnosis.—Legs and antenna yellow; posterior margin of eye projecting behind posterior margin of gena (Fig. 7) in lateral view; vertex with transverse carina and area below distinctly sculptured medially contrasting with smooth lateral area; head and thorax black; mesocutum and axilla smooth. Male scape with sensory patch extending for most of top half of scape with about 13 sensillae (Fig. 10).

This species is somewhat similar to *Deutereulophus floridensis* which also has the dorsal thorax mostly smooth and shiny.

However, *D. floridensis* has a distinct metallic green sheen to the head (black in *occularis*), mesoscutal side lobes and propodeum, and the posterior margin of the gena is on line with the posterior margin of the eye. In addition, *D. floridensis* has the posterior margin of the eye ending about in line with the posterior margin of the gena when viewed laterally, and the vertex is rounded and not carinate.

Description.—Female. Length 2.3 mm. Color: Head and thorax black, antenna and legs light yellow except base of fore coxa brown; metasoma yellow except lateral margin of all but first tergum brown and with a median triangular brown spot which covers the last two terga and the median portion of the previous two terga. **Head:** Face and vertex mostly smooth with faint reticulation near eyes and on vertex. In frontal view, wider than high (56:38). Gena smooth. Clypeus set off by irregular suture line. Mandible with one large ventral tooth and 3 smaller dorsal teeth. Malar groove complete, slightly curved. Ratio of malar space: eye height = 10:25. Toruli inserted level with lower margin of eye. Ratio of width of face: width of eye = 28:15. Vertex with transverse carina, area behind carina smooth laterally and striate alutaceous to reticulate medially. Posterior margin of eye projecting behind posterior margin of gena (Fig. 7). Ocelli contiguous with margin of

vertex, POL 2.5× OOL. **Antenna:** Scape about 6.5× as long as wide. Flagellum with ratio F1:F2:F3:clava = 15:11:11:20, width 6 at F1 to 7 at clava. Scape with a sensory patch containing about 13 sensilla extending for almost entire length of top half (Fig. 10). **Mesosoma:** Pronotum weakly alutaceous to smooth, with numerous scattered setae (Fig. 8). Mesoscutum smooth anteriorly, then becoming alutaceous, with 2 pairs of setae along notaular margin, side lobes smooth, with a group of setae along anterior edge. Axillae smooth. Scutellum very weakly alutaceous medially. Metanotum projecting out from scutellum anteriorly, smooth. Propodeum smooth medially, with about 7 long white setae latera to spiracle and about 30 setae below spiracle. Petiole rugose dorsally, about as long as wide, dorsal anterior flange large and tongue-like with lateral flanges well developed. Forewing. Hyaline, 2.5× longer than wide. Submarginal vein with 6–7 dorsal setae. Ratio submarginal: marginal: stigmal: postmarginal veins: 45:50:20:25. **Metasoma:** Ovate, slightly longer than wide. Ovipositor sheaths reaching just past tip of gaster.

Male.—Similar to the female except: Antenna with scape about 5× as long as wide, with sensory patch about ½ length of scape and containing 12–15 sensillae (Fig. 10). Flagellum with 4 funicular segments and 2-segmented clava. Ratio of F1:F2:F3:F4:clava = 15:15:15:15:24.

Distribution.—Known only from the type locality in Florida.

Types.—Holotype female with data: Florida: Monroe Co., NoName Key, 19-XI-85–25-II-86. S. & J. Peck. Hammock forest. Malaise & FIT. Deposited in CNC. Paratypes 1 female and 1 male with same data except female collected 3-VIII–18-XI-85 and male collected 4-III–29-IV-85. Female paratype deposited in USNM, male in CNC.

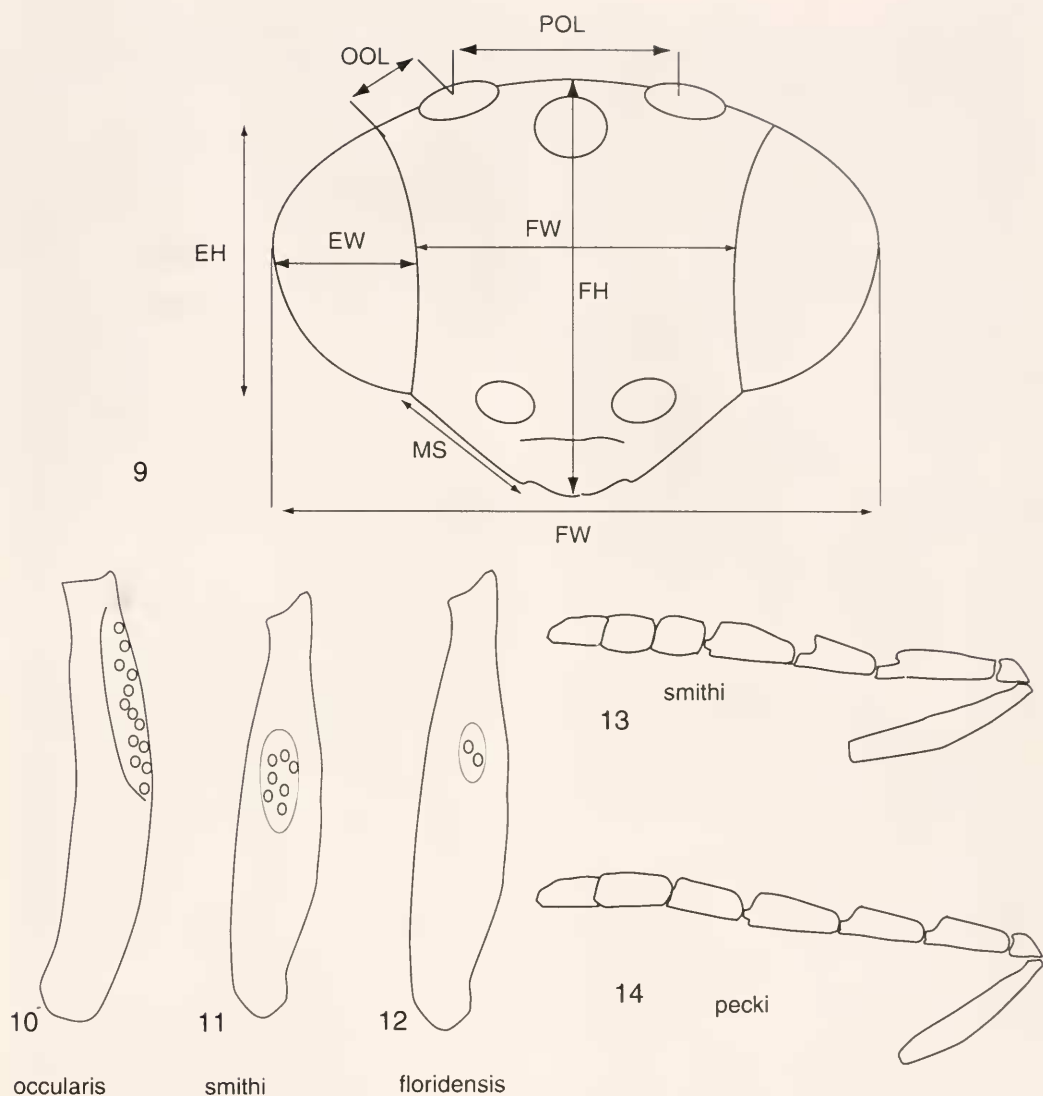
Etymology.—This species epithet refers to the eyes.

Deutereulophus pecki Schauff, new species
(Fig. 14)

Diagnosis.—Legs yellow; antennal funicle brown; first funicular segment equal in length to second; mesoscutum, axilla, and scutellum mostly smooth with only very light reticulation on anterior mesoscutum.

This species is similar to *D. occularis* and *D. floridensis* in that the scutellum is smooth and the legs yellow. However, *D. pecki* has the first funicular segment of the female antenna equal in length to the second (distinctly longer in both *D. occularis* and *D. floridensis*) and the flagellum brown (yellow in *D. occularis* and *D. floridensis*).

Description.—Female. Length 1.1 mm. Color: Head and thorax dark brown; scape and legs light yellow; funicle brown; metasoma yellow. **Head:** Face and vertex mostly smooth with faint reticulation near eyes and on vertex. In frontal view, head wider than high (56:38). Gena smooth. Clypeus set off by irregular suture line. Mandible with one large ventral tooth and 3 smaller dorsal teeth. Malar suture complete, straight. Ratio of malar space: eye height = 12:25. Toruli inserted level with lower margin of eye. Ratio of width of face: width of eye = 33:15. Vertex acute, but without transverse carina, striate alutaceous to reticulate above and smooth below. Posterior margin of eye ending before posterior margin of gena. Ocelli slightly removed from margin of occiput, POL 2.0× OOL. **Antenna:** Scape about 6.5× longer than wide. Ratio of length of F1:F2:F3:clava = 10:10:11:24, width 6 at F1 to 7 at clava (Fig. 14). **Mesosoma:** Pronotum weakly alutaceous to smooth, with numerous scattered setae. Mesoscutum smooth anteriorly to very weakly reticulate at lateral margin, with 2 pairs of setae along notaular margin, side lobes smooth medially and weakly reticulate at lateral margin, with a single seta along anterior edge. Axilla smooth. Scutellum smooth



Figs. 9–14. *Deutereulophus*. 9, Generalized head, anterior view. OOL = ocellar ocular length. POL = posterior ocellar length. EH = eye height. EW = eye width. FW = face width. FH = face height. MS = malar space. HW = head width. 10–12, male scapes. Figs. 13–14. Antennae. 13, female. 14, male.

with only a faint hint of reticulation medially. Metanotum smooth, projecting out from scutellum anteriorly. Propodeum smooth medially, with about 7 long white setae lateral to spiracle and about 6 setae below spiracle. Petiole rugose dorsally, about as long as wide, and anterodorsal flange large and tongue-like with lateral flanges well developed. Forewing. Hyaline, $2.4\times$ as long as wide. Submarginal

vein with 4 dorsal setae. Ratio submarginal: marginal: stigmal: postmarginal veins = 40:30:20:15. **Metasoma:** Ovate, slightly longer than wide. Ovipositor sheaths reaching just past tip of gaster.

Male.—Unknown.

Distribution.—Known only from the type locality in Florida.

Types.—Holotype female with data: Florida: Monroe Co., Key Largo, Sec. 35,

1-VIII-16-XI-85. S&J Peck. Hammock forest. Malaise & FLT. Deposited in CNC.

Etymology.—This species is named for Stuart Peck who collected many of the specimens included in this study.

Deutereulophus smithi Schauff, new species

(Figs. 1, 11, 13)

Diagnosis.—Legs except coxae white to yellow except fore coxae black; first funicular segment distinctly longer than second; occiput with distinct median carina, evenly, but very weakly sculptured, nearly smooth behind posterior ocelli; mesoscutal side lobes reticulate or alutaceous; scutellum alutaceous. Male scape with small sensory patch containing about 6 sensillae (Fig. 11).

This species is similar to *D. arizonensis*, which also has mostly yellow legs (except for the fore coxae). However, *D. arizonensis* has a rounded vertex without a distinct transverse carina and occiput with a triangular smooth spot bordered laterally by distinct sculpture (Fig. 2).

Description.—Female. Length 2.0–2.2 mm. Color black except as follows: scape white, pedicel and first funicular segment yellow, remainder of flagellum brown; fore coxa brown or brown basally, becoming yellow in apical half, rest of legs yellow to white with occasional brownish infuscation on fore femur. **Head:** Face weakly reticulate to nearly smooth, sculpture slightly stronger below toruli. Head in frontal view, wider than high (FH:FW = 60:43). Gena reticulate. Clypeus set off by irregular suture line. Mandible with one large ventral tooth and 3 smaller dorsal teeth. Malar suture complete, slightly curved. Ratio of malar space: eye height = 8:13. Toruli inserted level with lower margin of eye. Ratio of width of face: width of eye = 38:15. Vertex with distinct transverse carina, occiput smooth to weakly alutaceous, shiny. Posterior margin of eye on same line as posterior margin of gena. Ocelli contiguous with margin of occiput,

POL 2× OOL. **Antenna:** Scape about 7× as long as wide. Ratio of length of F1:F2:F3:clava = 20:14:15:25, width 6 at F1 to 7 at clava (Fig. 13). **Mesosoma:** Pronotum reticulate except at posterior margin, with numerous scattered setae (Fig. 1). Mesoscutum smooth anteriorly, then becoming alutaceous to reticulate posteriorly, with 2 pairs of setae along notaular margin, side lobes reticulate laterally, then alutaceous with a group of setae along anterior margin. Axilla smooth. Scutellum alutaceous to reticulate. Metanotum projecting out from scutellum anteriorly and bordered along median dorsal edge by a group of alveoli and by another band of finer alveoli along posterior margin. Propodeum medially smooth, with about 12 long white setae laterad of spiracle and about 20–25 setae below spiracle. Petiole rugose dorsally, slightly wider than long, anterodorsal flange small with lateral flanges well developed. Forewing. Hyaline or with very slight infuscation below marginal vein, 2.1× longer than wide. Submarginal vein with 6–7 dorsal setae. Ratio submarginal: marginal: stigmal: postmarginal vein = 35:35:12:15. **Metasoma:** Ovate, slightly longer than wide. Ovipositor sheaths reaching just past tip of gaster.

Male.—Similar to female except as follows: Fore coxae sometimes completely yellow; antenna with scape about 5× as long as wide and with a small sensory patch containing about 7 sensillae just above midline (Fig. 11). Flagellum with ratio of F1:F2:F3:F4:clava = 20:17:17:17:24.

Distribution.—Florida, Georgia, Louisiana, Maryland, Texas, and Virginia. Most records are from Maryland, Virginia, and Florida but this is no doubt due to extensive collecting in these areas. The range is almost certainly broader than indicated by the specimens available.

Variation.—The forewing of females may have a noticeably infuscate brown area behind the marginal vein which extends to the hind margin of the wing. Col-

oration of the metasoma ranges from nearly entirely black to mostly yellow with some brown spots laterally. The fore coxa may be entirely yellow or have the basal half brown to black. In one specimen from Texas with a very darkly infuscated area on the forewing, the legs are also light brown. The flagellum varies from a dark honey yellow to brown but in most specimens the color is distinctly lighter on the first funicle.

Types.—Holotype female with data: Virginia: Essex Co., 1 mi. E. Dunnsville, 17-IX-10-X-1991, Malaise trap. D. R. Smith. Deposited in USNM. Paratypes: 3 females same as holotype; 3 females Virginia: Louisa Co., 4 mi. S Cuckoo, 12-27.V.1987, J. Kloke & D. R. Smith, malaise trap; 1 female and 4 males with same as previous except 19.VIII-2.X.1987; 1 female and 1 male 16-31.VII. 1987; 1 male 25.VI-5.VII.1987; 2 males 3-24.IX.1987; 1 female VA: Page Co., Shenandoah Nat. Pk., 5-22.V.1987, 1300m, CNC [BRD] Hym. team, malaise trap in meadow; 1 male VA: Fairfax Co., near Annandale, 29.III-11.IV.1988, malaise trap, D.R. Smith; 1 male Maryland: Howard Co., Clarksville, 3.VIII.1986; 1 female same as previous except 13.VII.1986; 2 females Florida: Monroe Co., Big Pine Key, Watson's Hammock, 3.VI-27.VIII.1986, S&J Peck, malaise trap deposited in USNM; 1 female Texas: Jim Wells Co., 8 mi. W Ben Bolt La Copita Research Station, 20.V.1987, 87/006, J.B. Woolley deposited in TAMU; following all deposited in CNC: 4 females Maryland: Calvert Co., 6 km W Prince Frederick, 18-26.VIII.1986, Sharkey; same as previous except 3 females and 5 males 25.VIII.1986; 2 females and 1 male 7 km S Prince Frederick, 24.IX-14.XI.1987, Malaise trap, hardwood forest, CNC [BRD] Hym team; 3 males 4 mi. S Prince Frederick Co., 16.IV.-7.V.1987, L. Masner, Flight intercept trap; Calvert Co., 1 female Scientist's Cliffs, 7.VII. 1987, G. Gibson; 1 female Port Republic, VIII-IX.1986, Sharkey & Monroe; 1 female Chesapeake Bay Beach, 13.VI.1985,

L. Masner, s.s., plants in forest; 2 males Seneca, Potomac River trail Mouth of Seneca Creek.), 16.VI.1986, L. Masner, SS, undergrowth along old canal; 1 male Prince George's Co., Patuxent Research Station 21-29.VI.1986. D. Wahl, Malaise trap; 1 female Kentucky: Rowan Co., 24 km SW Morehead, Cave Run Lake, 14.V-20.VIII.1983, M. Kaulbars; 1 female and 1 male Georgia: Clarke Co., Lake Herrick, Oconee Forest Park., 11-12.VII.1987, L. Dumouchel; 1 male McIntosh Co., Sapelo Island, 9-21.IX.1987, live oak forest, CNC [BRD] team; 1 male 15.IX-16.XI.1987; Athens, 1 female 14.IX.1987, L. Masner; 1 female and 1 male Louisiana: Grant Parish, 28 km N Alexandria, Stuart Lake Campground, 19-21.V.1983, M. Kaulbars; 4 males Florida: Alachua Co., Gainesville, 1.V-20.VIII.1988, D. Wahl, flight intercept trap; 1 female same as previous except (AEI), 30.IV.1987, SS, L. Masner, 87/14; 1 male 10-20.II.1987, W. Mason; 1 female 8-14.IV.1987; 1 female 15-22.III.1987, Malaise trap, hardwood forest; 1 male American Entomological Institute, 9-17.IV.1986, G. Gibson, sweep; 3 females and 5 males Tallahassee, 18-23.V.1986, H. Howden, flight intercept trap; 3 females Monroe Co., Big Pine Key, Watson's Hammock, I.XI.84-3.III.1985, S&J Peck flight intercept trap; 1 female same as previous except 19.XI.1985-25.II.1986; 1 female 3.V-3.VIII.1985; 23.II-3.VI.1986; 1 female 3.VI-27.VIII.1986, hammock forest, Malaise trap/flight intercept trap, 86-10; 2 females Dade Co., S Miami, 7900 Swth St., Old Cutler Hammock, 21.II-1.VI.1986, flight intercept trap, S&J Peck, hammock; 1 female Chekika State Recreation Area, 50 km SW Miami, Grossman Hammock, 1.IX.1984-3.III.1986, S&J Peck, flight intercept trap; 1 male 3.III.-28.IV.1985; 2 females and 3 males Fat Deer Key, 4.III-28.IV.1985, S&J Peck, hammock forest, malaise & flight intercept trap; 4 females Monroe Co., Everglades National Park, Royal Palm Hammock; 1.XI-3.III.1985, S&J Peck, malaise; 2 females and 3 males

1.5 km NW Royal Palm, 3.III.–28.IV.1985, hardwood hammock forest, malaise-flight intercept trap; 2 females N. Key Largo, Sec. 35, 4.III–4.VIII.1985, S&J Peck, hammock forest, malaise & flight intercept trap; 4 females and 1 male same as previous except 4.III–28.IV.1985; 1 male 4.VIII–16.XI.1985; 1 female St John's Co., Theodore Roosevelt Preserve, 13.X.1980, Masner & Bowen, 8029; 1 female Liberty Co., Torreya St. Pk, 7.X.1980, 8022, Masner & Bowen; 4 females and 4 males Texas: San Jacinto Co., 5 km S Coldspring Double Lake Campground, 22–24.V.1983, M. Kaulbars; 1 male Brazos Co., College Station, 1982, R. Wharton, M. Hrnir, pan trap.

Etymology.—This species is named in honor of David R. Smith, Systematic Entomology Laboratory, USDA, who collected part of the type series and whose collecting over the years has added greatly to the U.S. National Collection of Insects.

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